FACT SHEET FOR NPDES PERMIT NO. WA0040762

City Of Yelm Wastewater Treatment and Reclamation Facility

SUMMARY

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INTRODUCTION

The Federal Clean Water Act (FCWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES), which is administered by the Environmental Protection Agency (EPA). The EPA has delegated responsibility to administer the NPDES permit program to the state of Washington on the basis of Chapter 90.48 Revised Code of Washington (RCW) which defines the Department of Ecology's (Department) authority and obligations in administering the wastewater discharge permit program.

The regulations adopted by the state include procedures for issuing permits [Chapter 173-220 Washington Administrative Code (WAC)], technical criteria for discharges from municipal wastewater treatment facilities (Chapter 173-221 WAC), water quality criteria for surface and ground waters (Chapters 173-201A and 200 WAC), and sediment management standards (Chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastewater to waters of the state is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-220-060) for issuing a permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the availability of the draft permit is required at least thirty days before the permit is issued (WAC 173-220-050). The fact sheet and draft permit are available for review (see Appendix A--Public Involvement of the fact sheet for more detail on the Public Notice procedures).

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in this review have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Comments and the resultant changes to the permit will be summarized in Appendix D--Response to Comments.

GENERAL INFORMATION	
Applicant:	City of Yelm 105 Yelm Avenue West P.O. Box 479 Yelm, WA 98597-4079
Facility Name and Address:	City of Yelm WWTP 931 N.P. Road NE Yelm, WA 98597-4079
Type of Treatment:	STEP collection followed by secondary treatment (SBRs), and coagulation and flocculation with filtration to meet Class A reclaimed water requirements.
Discharge Location:	Outfall #001: Reclaimed water distribution for public and private uses throughout the City to include irrigation, constructed wetlands and rapid infiltration to ground water. Outfall #002: City of Centralia Power Canal 185 ft. downstream from the Burlington Northern Railroad bridge. The distance from the point of discharge into the canal back to the Nisqually river is ~3.04 miles. (Standby Outfall) Latitude: 46° 57' 15" N Longitude: 122° 35' 00" W. Outfall #003: Nisqually River @ RM 19.8 (Used only when the power canal is shut down for inspection and unable to produce or use 100 percent reclaimed water upland) Latitude: 46° 57' 30" N Longitude: 122° 34' 30" W.
Water Body ID Number:	WA-11-1020 (Nisqually River from Murray CR. @ RM 19.1 to Alder Dam @ RM 44.2)

BACKGROUND INFORMATION

HISTORY

The City of Yelm (City) is located approximately 15 miles southeast of Olympia near the Nisqually River. The City is bordered on the northeast by the Nisqually River and on the northwest by Fort Lewis. The existing corporate boundaries encompass about 5.4 square miles and the UGA covers about 9.5 square miles. The City population is currently over 2,188 with a projected growth, to about 8,000 by the year 2004 and 18,000 by the year 2014.

Due to groundwater contamination with high levels of nitrates from septic tank drainfields the Thurston County Health Department cited the water supply of Yelm as a potential serious health hazard in 1988. Yelm was required to install a sanitary sewer collection system and treatment plant to correct the problem. With the aid of state and federal grants and loans a Septic Tank Effluent Pump (STEP) sewer system and 0.3 MGD two-stage aerated lagoon treatment plant were constructed and put into service in January 1994. The STEP system replaced the inadequate septic tanks and drain fields that were the source of the nitrates found in the groundwater.

The treatment plant was constructed with an outfall to both the Centralia Power Canal as the primary discharge point, and to the Nisqually River as a standby discharge point. The shoreline permit (SH-TCO-92-012) for the project required that the discharge point to the Nisqually River be removed by March 1997, and the discharge to the Power Canal be converted to a standby outfall only, by March 1999 (extended to the year 2001). This stipulation prompted Yelm to pursue a water reuse program to treat its wastewater to tertiary levels and reuse 100 percent of the reclaimed water for landscape irrigation and other uses in and around the City. Reuse of the City's wastewater will allow Yelm to eliminate the need for discharge to the Nisqually River except in emergency situations and to convert the power canal to a standby outfall.

The lagoon treatment plant was not capable of providing the means for the necessary treatment to attain "Class A" reuse quality. Also, the treatment plants capacity of 0.30 MGD was not adequate to meet the projected growth demands of the City. Consequently the lagoon treatment system was replaced by a Sequence Batch Reactor (SBR) with an increased capacity to 1.0 MGD. Tertiary facilities consist of an influent pump station, coagulation, flocculation and settling, rapid-sand filtration, and disinfection. These facilities are scheduled to be completed in May 1999, and should meet the needs of the Yelm community for 100 percent reclamation and reuse until at least the year 2004 under existing population growth projections. An additional 1.2 MGD expansion to the treatment facility may be required at that time to meet growth projections to the year 2015. These improvements to Yelm's WWTP will allow the City to fulfill the requirements of the Shoreline Permit to convert the discharge point to the Centralia Power Canal to a standby outfall only, by March 1999 (extended to the year 2001).

COLLECTION SYSTEM STATUS

To replace the existing septic tanks and drain fields, a primary treatment and collection system, which utilizes the STEP system consisting of septic tanks, effluent pumps, and force mains which transport the effluent from the septic tanks to the wastewater treatment facility, was installed in January 1994. Each residence, apartment and commercial/industrial customer that is connected to the STEP system is furnished with a new STEP tank and pumping system which is owned and maintained by the City. This system provides a pressure collection system which reduces the problems of inflow and infiltration associated with gravity collection systems. Since the entire system is less than five years old and all

septic tank installations undergo leak testing at the time of installation, the system to date has been very water tight.

There are approximately 720 connections and 16,000 lineal feet of STEP collection line servicing a population of about 2,000 people. Design capacity of the plant is 1 MGD and based on current flow rates per connection. An additional 2,000 connections could be added before 85 percent of the hydraulic capacity of the plant would be reached.

The current STEP collection system serves the downtown area and the Kings View development NW of the treatment plant. Since 1991, several large annexations have added over 2,200 acres to the existing city limits. It is anticipated that the STEP service area will encompass the entire urban growth boundaries of the City by the year 2015.

TREATMENT PROCESSES

Wastewater enters the plant through a 12" PVC STEP force main at an influent control structure with an influent riser that has an overflow weir at elevation 347.50' which is higher than any point in the service area to keep all of the pressure collection force mains full. The wastewater then flows by gravity to the sequence batch reactors (SBRs). There are three cells at 0.6 million gallons each, only two cells are needed at a time for the sequencing operation and the third is used as a standby. Decant water from the SBRs flows by gravity to the equalization basin with five surface aerators and a volume of 1.8 million gallons. Flow is pumped from the equalization basin to the tertiary treatment area where alum/polymer is added and mixed through an inline static mixer to the granular media (GM) (Dynasand) filters. Flow from the GM filters is chlorinated and runs through a 34,000 gallon contact chamber before being discharged through an effluent weir. If the quality of the water meets the State's Water Reclamation Criteria and there is a demand for reuse water, the reclaimed water is pumped to its' beneficial use. If there is insufficient demand for the reuse water or the water does not meet the reclaimed water standards, but does meet the surface water standards, the water is dechlorinated and discharged through the standby outfall in the Centralia Power Canal. In emergency situations, wastewater could be discharged to the outfall located on the Nisqually River.

DISCHARGE OUTFALLS

Re-labeling Outfalls - In the previous permit the discharge point to the Power Canal was designated as Outfall #001 and the Nisqually River as Outfall #002. Now that the City is reclaiming their wastewater the main discharge point will be the distribution of reclaimed water which will be given the designation of Outfall #001. The Power Canal will no longer serve as the primary discharge point and will be re-labeled as Outfall #002. The Nisqually River will be kept as an emergency discharge point only for times when the Power Canal is shut down and 100 percent reuse is not possible and will be re-labeled as Outfall #003.

Outfall #001 Class A Reclaimed Water - The system to distribute reclaimed water to various points of application throughout the city consist of a primary pump station located at the plant and several miles of various sizes of Class 200 PVC piping and valving.

The points of application of reclaimed water consist of constructed wetlands located at Yelm High School and Cochrane Park followed by infiltration basins. Irrigation projects include City Park, Cochrane Park, Yelm Middle School and High School. Other potential uses include delivering reclaimed water to a car wash facility, concrete manufacturer, and the THA golf course.

Outfall #002 Centralia Power Canal - The City of Yelm has a signed agreement with the City of Centralia to discharge effluent from the Yelm wastewater treatment plant to the Centralia Power Canal which then flows approximately 3.04 miles back to the Nisqually River. The agreement includes a condition that the City of Yelm shall cease discharge to the canal whenever the canal must be shut down for maintenance, inspection or anytime flow in the canal drops below 200 cfs.

The outfall is an open ended 12" HDPE pipe side bank discharge and facing downstream is located on the left bank of the canal. The outfall was not submerged to allow canal officials to inspect the outfall for debris entering the canal.

Outfall #003 Bypass Reach of the Nisqually River at the Yelm Hydroelectric Project - Thurston County issued a shoreline permit for an emergency outfall directly to the Nisqually River to accommodate those periods when the flow to the Centralia Power Canal is shut down for maintenance or inspection. The shoreline permit was issued with some very important conditions:

> Within three years of operation of the City's sewage treatment facility, the City shall remove the standby outfall to the Nisqually River.
>
> Within five years of operation of the City's sewage treatment facility, the City shall convert the Centralia Power Canal to its standby outfall.

As part of the terms and conditions of the shoreline settlement agreement the City of Yelm agreed to pursue reuse options to reduce the reliance for discharges to the Centralia Power Canal and all but eliminate the need for discharges to the Nisqually River.

The 1993 Settlement Agreement was amended in 1997 to extend the deadlines for an additional three years. The date by which the outfall to the Nisqually River is to be removed is extended until June 30, 2000. The deadline for converting the Centralia Power Canal to a standby outfall is extended until June 30, 2002.

The Nisqually River outfall line is a submerged 7" HDPE pipe in a ductile iron sleeve with a tideflex check valve extending approximately 12 feet from the bank and facing downstream is located on the left bank of the Nisqually River.

7-Q-10 LOW FLOW

Low flow in the Nisqually River is controlled by Alder and LaGrande Dams. The dams are operated by Tacoma Power under an instream flow agreement and its FERC license. The Instream Flow Agreement was negotiated in context of Centralia's relicensing of the Yelm Diversion Hydroelectric project. This agreement was formally adopted by the Nisqually River Coordinating Council (NRCC) and recommended to FERC. The adoption of instream flows was preceded by nearly ten years of flow-related studies and negotiations by several agencies and the Tribe. This agreement and subsequent arbitration resulted in the promulgation of Chapter 173-511 WAC pursuant to Chapters 90.54 and 90.22 RCW. As a result of that agreement Tacoma City Light is required to release flows from LaGrande Dam which are sufficient to maintain minimum flows in the mainstem and the by-pass section of the Nisqually River at the Yelm Diversion Hydroelectric Project, as follows:

	Bypass	Mainstem
October 1 - December 15	550 cfs	700 cfs
December 16 - May 31	600 cfs	900 cfs
June 1 - July 31	500 cfs	750 cfs
August 1 - September 30	370 cfs	575 cfs

The lowest flow in the bypass section of the Nisqually River during the critical period from August 1, to September 30, must equal or exceed 370 cfs and will be used as the 7-Q-10 low flow for the bypass reach of the Nisqually River at the Yelm Diversion Hydroelectric Project.

The 7-Q-10 low flow in the Power Canal was based on the agreement signed by the City of Yelm and the City of Centralia for use of the canal by Yelm as a discharge point for their wastewater discharge. The use agreement signed November 26, 1991, stipulates that whenever the flow in the canal drops below 200 cfs the City of Yelm is required to divert their wastewater discharge to an alternate discharge point. Centralia is required to provide as much notice as is reasonably possible to Yelm whenever the flow in the canal might drop below 200 cfs and Yelm is required to immediately divert their effluent flow from the canal. Therefore the 7-Q-10 low flow for the Power Canal will be 200 cfs.

RESIDUAL SOLIDS

The first stage of treatment in a STEP system is the individual tanks located at residences and businesses throughout the City where residual solids accumulate. Residential tanks will be measured on a three-year average and commercial tanks on an annual basis. Once accumulation of sludge in the tanks has reached a pre-determined level ($\pm$ 40 percent of volume) the sludge in the STEP tanks will be removed and properly disposed.

At the treatment plant, sludge will be generated through biological treatment using the Sequencing Batch Reactor (SBR) operating system which develops excess biological organisms or waste sludge. The total amount of sludge expected to be produced, including alum sludge, is estimated as approximately equivalent in pounds per day as the BOD loading on the treatment plant.

Waste sludge and skimmings from the SBRs are stored in a solids holding vault and periodically pumped to the solids handling facility which includes polymer addition and a gravity belt thickener which should produce a sludge with about a three to four percent solids content.

The City has contracted with a local sludge handling company to transport the sludge to the LOTT treatment plant for co-processing with LOTTs sludge or to be hauled away for further processing and land application by the sludge hauler.

The previous permit required the development of a long-range sludge hauling and disposal plan once the on-going monthly/yearly sludge removal volumes are determined. This plan is to be developed and approved by the Department prior to the issuance of this permit.

PERMIT STATUS

The previous permit for this facility was issued on January 20, 1994. The previous permit placed effluent limitations on 5-day Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), Fecal Coliform Bacteria, pH, and Total Residual Chlorine.

An application for permit renewal was submitted to the Department on September 9, 1998, and accepted by the Department on August 27, 1998.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

The facility received its last inspection on August 8, 1998. The facility was under construction to upgrade the facility from a lagoon treatment plant to sequence batch reactor system with filtration and disinfection to produce Class A Reclaimed Water for uses in and around the City of Yelm. The inspection was conducted to aid in the drafting of the City's NPDES permit. During the inspection all monitoring records and paperwork appeared to be in order and operator and laboratory certifications were current.

During the history of the previous permit the Permittee has had two violations for BOD_5, one for TSS, and two for pH, based on Discharge Monitoring Reports (DMRs) submitted to the Department.

WASTEWATER CHARACTERIZATION

The City of Yelm is currently undergoing a major upgrade to their treatment plant from a lagoon treatment system to a Sequencing Batch Reactor (SBR) with tertiary facilities for coagulation, flocculation, rapid-sand filtration, and disinfection. Since these facilities were not operational until May 1999, monitoring data representative of normal operation is not available.

The concentrations of pollutants in Table 1 are for the lagoon treatment system that has been in operation since January 1994. The effluent is characterized as follows:

Table 1: Wastewater Characterization

Parameter	**Annual Average Daily Values**
Discharge Flow	0.163 MGD
Biochemical Oxygen Demand	20 mg/L
Total Suspended Solids	18 mg/L
Total Residual Chlorine	0.03 mg/L
Ammonia (as N)	27 mg/L
Dissolved Oxygen	7.7 mg/L
Parameter	**Highest Monthly Average**
Total Fecal Coliform	17.6 count/100 mL

SEPA/NEPA COMPLIANCE

The EPA National Environmental Policy Act (NEPA) was completed for this project. The NEPA process satisfies the State Environmental Policy Act (SEPA) requirements. No specific environmental compliance issues were noted in the approved environmental documents.

PROPOSED PERMIT LIMITATIONS

Federal and state regulations require that effluent limitations set forth in a NPDES permit must be either technology or water quality-based. Technology-based limitations for municipal discharges are set by regulation (40 CFR 133, and Chapters 173-220 and 173-221 WAC). Water quality-based limitations are based upon compliance with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC) or the National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992.) The most stringent of these types of limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based in part on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the state of Washington were determined and included in this permit. The Department does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Permittee is required to notify the Department.

Due to conditions in the shoreline permit (SH-TCO-92-012) for removal of the discharge to the Nisqually River and conversion of the Power Canal discharge to a standby outfall, the Permittee has committed to, and will be required to, generate and distribute Class A reclaimed water. The standards for reclaimed water are technology-based standards outlined in the states Water Reclamation and Reuse Standards, publication #97-23. For parameters addressed in the reclaimed water standards, the limitations are equal to or more stringent than the technology-based or water quality-based standards required by federal and state law. For those parameters not addressed in the reclaimed water standards, the appropriate technology-based or water quality-based standards have been applied.

CURRENT PERMIT LIMITATIONS

A.1	**EFFLUENT LIMITATIONS: Nisqually River and Centralia Power Canal**	
Parameter	**Average Monthly**	**Average Weekly**
BOD_5	30 mg/L, 75 lbs/day	45 mg/L, 113 lbs/day
Total Suspended Solids	30 mg/L, 75 lbs/day	45 mg/L, 113 lbs/day
Fecal Coliform Bacteria	200 count/100 mL	400 count/100 mL
pH	Shall not be outside the range of 6.0 to 9.0 standard units	

A.2	**ADDITIONAL EFFLUENT LIMITATIONS FOR: Centralia Power Canal**
Total Residual Chlorine	Total available (residual chlorine shall be minimized. Residual chlorine discharged to the canal shall not exceed the amount required to achieve the fecal coliform limits specified.
Total Ammonia (as NH_3-N)	**The concentration of ammonia discharged to the canal shall be minimized through proper operation and maintenance of the WWTP.**

A.3	**ADDITIONAL EFFLUENT LIMITATIONS FOR: Nisqually River**	
Parameter	**Average Monthly**	**Maximum Daily**
Total Residual Chlorine	0.019 mg/L	0.038 mg/L

PROPOSED PERMIT LIMITATIONS

	EFFLUENT LIMITATIONS: Outfall #001 - Reclaimed Water Discharge		
Parameter	**Average Monthly**	**Average Weekly**	**Maximum Daily**
BOD_5	30 mg/L, 250 lbs/day	N/A	N/A
Total Suspended Solids	30 mg/L, 250 lbs/day	N/A	N/A
Dissolved Oxygen	Shall be present in the discharge		
pH	Shall not be outside the range of 6.0 to 9.0 standard units		
Total Nitrogen, as the sum of TKN, Nitrate and Nitrite	10 mg/L	N/A	N/A
Parameter	**Average Monthly**	**7-Day Limit**	**Sample Maximum**
Total Coliform Bacteria	N/A	2.2 count/100 mL	23 count/100 mL
Turbidity	2 NTU	N/A	5 NTU

	EFFLUENT LIMITATIONS: OUTFALL # 002- Centralia Power Canal	
Parameter	**Average Monthly**	**Average Weekly**
BOD_5	30 mg/L, 250 lbs/day	45 mg/L, 375 lbs/day
Total Suspended Solids	30 mg/L, 250 lbs/day	45 mg/L, 375 lbs/day
Fecal Coliform Bacteria	100 count/100 mL	200 count/100 mL
pH	shall not be outside the range of 6.0 to 9.0 standard units	
Total Residual Chlorine	0.5 mg/L	0.75 mg/L
Total Ammonia (as NH_3-N)	3.0 mg/L	N/A

	EFFLUENT LIMITATIONS: OUTFALL # 003- Nisqually River	
Parameter	**Average Monthly**	**Average Weekly**
BOD_5	30 mg/L, 250 lbs/day	45 mg/L, 375 lbs/day
Total Suspended Solids	30 mg/L, 250 lbs/day	45 mg/L, 375 lbs/day
Fecal Coliform Bacteria	100 count/100 mL	200 count/100 mL
pH	Shall not be outside the range of 6.5 to 8.5 standard units	
Total Ammonia (as NH_3-N)	3.0 mg/L	N/A
Parameter	**Average Monthly**	**Maximum Daily**
Total Residual Chlorine	0.028 mg/L	0.076 mg/L

	GROUND WATER LIMITATIONS: Ground Water Recharge Criteria for Ground Water Recharge by Surface Percolation
Parameter	**Sample Maximum[a]**
Nitrate (as N)	10 mg/L
Nitrite (as N)	1.0 mg/L
Fluoride	4.0 mg/L
Arsenic	50 µg/L
Cadmium	5 µg/L
Chromium	100 µg/L
Mercury	2 µg/L
Nickel	100 µg/L
Total Trihalomethanes (TTHM)	0.10 mg/L
[a]The sample maximum is the highest allowable concentration for any sample as measured in the ground water at the top of the uppermost aquifer beneath or down gradient of the infiltration site.	

	ADDITIONAL GROUND WATER LIMITATIONS: Ground Water Recharge Criteria for Ground Water Recharge by Surface Percolation
Parameter	**Sample Maximum[a]**
Total Dissolved Solids	500 mg/L
Chloride	250 mg/L
Sulfate	250 mg/L
Copper	1300 µg/L
Lead	15 µg/L
Manganese	50 µg/L
Silver	100 µg/L
Zinc	5000 µg/L
[a]The sample maximum is the highest allowable concentration for any sample as measured in the ground water at the top of the uppermost aquifer beneath or down gradient of the infiltration site.	

DESIGN CRITERIA

In accordance with WAC 173-220-150 (1)(g), flows or waste loadings shall not exceed approved design criteria. The design criteria for the upgraded treatment facility were taken from the facilities plan prepared by Skillings/Connolly Inc., Consulting Engineers and are as follows:

Table 2: Design Standards for the City of Yelm's WWTP.

Parameter	**Design Quantity**
Monthly average flow (max. month)	1.0 MGD
Instantaneous peak flow	1.5 MGD
BOD_5 influent loading	1,500 lb./day
TSS influent loading	430 lb./day
Design population equivalent	7,423

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

Municipal wastewater treatment plants are a category of discharger for which technology-based effluent limits have been promulgated by federal and state regulations. These effluent limitations are given in the Code of Federal Regulations (CFR) 40 CFR Part 133 (federal) and in Chapter 173-221 WAC (state). These regulations are performance standards that constitute all known available and reasonable methods of prevention, control, and treatment for municipal wastewater.

The following technology-based limits for BOD_5, and TSS are taken from Chapter 173-221 WAC, the limit for Total Residual Chlorine is derived from standard operating practices according to the Water Pollution Control Federation (1976), the standards for Total Coliform Bacteria and Turbidity were taken from the states Water Reclamation and Reuse Standards, publication #97-23:

Table 3: Technology-based Limits.

Parameter	Limit
pH (Outfall #002)	Shall be within the range of 6 to 9 standard units
BOD_5 (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
TSS (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
Total Residual Chlorine (Outfall #002)	Average Monthly Limit is 0.5 mg/L, and according to WAC 173-221-030(11)(b), the corresponding weekly average = 0.75 mg/L
Total Coliform Bacteria (Outfall #001)	Average Weekly Limit is 2.2 count/100 mL and the sample maximum is 23 count/100 mL.
Turbidity (Outfall #001)	Average Monthly limit is 2 NTU and the sample maximum is 5 NTU

Federal and state regulations require POTW's to remove 85 percent of BOD and TSS from the influent wastewater. This removal requirement is difficult to assess in a STEP system which utilizes septic tanks as part of the treatment system. Septic tanks remove settleable solids and provide a limited amount of digestion of organic matter of domestic wastewater. For POTWs that receive domestic sewage after treatment in septic tanks (STEP system), the BOD_5 and solids removal in the septic tanks is considered an integral part of the treatment process for BOD_5 removal. Since it is impractical to measure the actual BOD_5 and solids entering the septic tanks, compliance with the 85 percent removal requirement will be assumed if the effluent concentration for BOD_5 and TSS meets 30 mg/L, and there is no excessive inflow and infiltration (I/I). Excessive I/I is defined by U.S. EPA criteria:

> Infiltration is excessive when the highest 7-14 day average daily dry weather flow is greater than 120 gallons per capita per day.
>
> Inflow is excessive when the highest recorded daily flow during a storm event is greater than 275 gallons per capita per day or when hydraulic overloading of the treatment plant occurs.

If the EPA screening criteria for I/I is not exceeded, the presumption is that the raw sewage influent would be at least 200 mg/L if the septic tanks were not present. These screening criteria apply regardless of whether the I/I can be cost effectively removed. Therefore, complying with the 30 mg/L effluent BOD_5 concentration limit means that the 85 percent removal requirement is also achieved.

If the EPA screening criteria are exceeded, the City will be required to implement a rehabilitation program to reduce I/I. The program will be agreed upon between the Department and the City, and the details (schedules, work plan, financial commitment) will be incorporated into an administrative order.

The permit will require:

> Monitoring and reporting of the influent BOD_5 and the percent BOD_5 removal accomplished at the WWTP.
>
> Annual reporting of the highest 7-14 day average daily dry weather flow rate and the highest 24-hour per capita daily flow rate.
>
> Institute and continue an adequate operation and maintenance program for the entire sewerage system including the septic tanks in the STEP system.

The following technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b).

> Monthly effluent mass loadings (lbs/day) were calculated as the maximum monthly design flow (1.0 MGD) x Concentration limit (30 mg/L) x 8.34 (conversion factor) = mass limit 250 lbs/day.
>
> Monthly effluent mass loadings (lbs/day) were calculated as the maximum monthly influent design loading (1,446 lbs./day) x 0.15 = 216 lbs/day.
>
> The weekly average effluent mass loading is calculated as 1.5 x monthly loading (250 lbs/day) = 375 lbs/day.

SURFACE WATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established Surface Water Quality Standards. The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) is a state regulation designed to protect the beneficial uses of the surface waters of the state. Water quality-based effluent limitations may be based on an individual waste load allocation (WLA) or on a WLA developed during a basin-wide total maximum daily loading study (TMDL).

NUMERICAL CRITERIA FOR THE PROTECTION OF AQUATIC LIFE

"Numerical" water quality criteria are numerical values set forth in the State of Washington's Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the levels of pollutants allowed in a receiving water while remaining protective of aquatic life. Numerical criteria set forth in the Water Quality Standards are used along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limitations, they must be used in a permit.

NUMERICAL CRITERIA FOR THE PROTECTION OF HUMAN HEALTH

The state was issued 91 numeric water quality criteria for the protection of human health by the U.S. EPA (EPA 1992). These criteria are designed to protect humans from cancer and other disease and are primarily applicable to fish and shellfish consumption and drinking water from surface waters.

NARRATIVE CRITERIA

In addition to numerical criteria, "narrative" water quality criteria (WAC 173-201A-030) limit toxic, radioactive, or deleterious material concentrations below those which have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health. Narrative criteria protect the specific beneficial uses of all fresh (WAC 173-201A-130) and marine (WAC 173-201A-140) waters in the state of Washington.

ANTIDEGRADATION

The State of Washington's Antidegradation Policy requires that discharges into a receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of a receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when the natural conditions of a receiving water are of higher quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. More information on the State Antidegradation Policy can be obtained by referring to WAC 173-201A-070.

The Department has reviewed existing records and is unable to determine if ambient water quality is either higher or lower than the designated classification criteria given in Chapter 173-201A WAC; therefore, the Department will use the designated classification criteria for this water body in the proposed permit. The discharges authorized by this proposed permit should not cause a loss of beneficial uses.

CRITICAL CONDITIONS

Surface water quality-based limits are derived for the waterbody's critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic water body uses.

MIXING ZONES

The Water Quality Standards allow the Department to authorize mixing zones around a point of discharge in establishing surface water quality-based effluent limits. Both "acute" and "chronic" mixing zones may be authorized for pollutants that can have a toxic effect on the aquatic environment near the point of discharge. The concentration of pollutants at the boundary of these mixing zones may not exceed the numerical criteria for that type of zone. Mixing zones can only be authorized for discharges that are receiving all known, available, and reasonable methods of prevention, control and treatment (AKART) and in accordance with other mixing zone requirements of WAC 173-201A-100.

Outfall #002 - Discharge to the Centralia Power Canal - The water in the canal is used only for power production and the entrance is screened to prevent fish from entering. The distance from the point of discharge into the canal back into the Nisqually River is approximately 3.04 miles. All beneficial uses of the river will be protected, as described in WAC 173-201A-030(2) Class A surface waters as the canal flow re-enters the Nisqually River (RM 12.6).

The dilution factor for effluent discharged to the Centralia Power Canal from the point of discharge 3.04 miles back into the Nisqually River was determined by calculating the effluent flow fraction to the canal flow. Allowing full dilution of the canal flow to the effluent flow both the acute and chronic dilution factors calculated out to be 130.

Outfall #003 - Discharge to the by-pass section of the Nisqually River at the Yelm Diversion Hydroelectric Project - The maximum boundaries of the mixing zones are defined as follows:

Chronic Mixing Zone: 19.7 feet wide, extends 301.5 feet downstream and 100.0 feet upstream.

Acute Mixing Zone: 19.7 feet wide, extends 30.15 feet downstream and 10.0 feet upstream.

The dilution factor for effluent discharged to the Nisqually River was determined through the use of the PLUMES Dilution Model. The PLUMES model calculated the centerline chronic dilution factor at 19.4 and the centerline acute dilution factor at 4.0. See Appendix C, for the PLUMES Dilution Model results.

The National Toxics Rule (EPA, 1992) allows the chronic mixing zone to be used to meet human health criteria.

DESCRIPTION OF THE RECEIVING WATER

The facility has two surface water discharges, Outfall #003 is a direct discharge to the Nisqually River (RM 19.8) and Outfall #002 is a discharge to the Centralia Power Canal which returns to the Nisqually River some 3.04 miles downstream (RM 12.6).

The Nisqually River is designated as a Class A (excellent) freshwater receiving water from its' mouth to Alder Dam (RM 44.2). The discharge to the Centralia Power Canal discharges back into the Nisqually River a Class A surface water and shall not cause a violation of water quality criteria at the point of entry back into the Nisqually River.

Characteristic uses include the following:

Water supply (domestic, industrial, agricultural); stock watering; fish migration; fish and shellfish rearing, spawning and harvesting; wildlife habitat; primary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce and navigation.

Water quality of this class shall markedly and uniformly exceed the requirements for all or substantially all uses.

SURFACE WATER QUALITY CRITERIA

Applicable criteria are defined in Chapter 173-201A WAC for aquatic biota. In addition, U.S. EPA has promulgated human health criteria for toxic pollutants (EPA 1992). Criteria for this discharge are summarized below:

Fecal Coliforms	100 organisms/100 mL maximum geometric mean
Dissolved Oxygen	8 mg/L minimum
Temperature	18 degrees Celsius maximum or incremental increases above background
pH	6.5 to 8.5 standard units
Turbidity	less than 5 NTUs above background
Toxics	No toxics in toxic amounts (see Appendix C for numeric criteria for toxics of concern for this discharge)

CONSIDERATION OF SURFACE WATER QUALITY-BASED LIMITS FOR NUMERIC CRITERIA

Pollutant concentrations in the proposed discharge exceed water quality criteria with technology-based controls which the Department has determined to be AKART. A mixing zone is authorized in accordance with the geometric configuration, flow restriction, and other restrictions for mixing zones in Chapter 173-201A WAC and are defined as follows:

The dilution factors of effluent to receiving water that occur within these zones have been determined at the critical condition by the use of the UM model component of PLUMES. The dilution factors have been determined to be (from Appendix C):

	Acute	Chronic
Aquatic Life Outfall #002	130	130
Outfall #003	4	19.4

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near field) or at a considerable distance from the point of discharge (far field). Toxic pollutants, for example, are near-field pollutants, their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as BOD is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

The derivation of water quality-based limits also takes into account the variability of the pollutant concentrations in both the effluent and the receiving water.

The critical condition for the Nisqually River and the Centralia Power Canal is the seven day average low river flow with a recurrence interval of ten years (7Q10). The ambient background data used for this permit includes the following from Station Number 11A080 Nisqually River @ McKenna located at

River Mile 21.8 with a period of record lasting from April 1990 to September 1993. The other station used to obtain ambient data was a downstream Station Number 11A070 Nisqually River @ Nisqually located at River Mile 3.4:

Parameter	**Effluent**	
Discharge (cfs)	1.547 cfs (1.0 MGD)	
Alkalinity	90 mg/L typical value	
CBOD	45 mg/L based on BOD_5 from DMRs	
NBOD	4.57*(51 mg/L Ammonia + 15 mg/L Organic N typical value) = 302 mg/L	
Dissolved Oxygen	1.1 mg/L	
Temperature ^oC	23 for DO analysis and 14 for pH analysis	
Parameter	**Outfall #002**	**Outfall #003**
7Q10 low flow	200 cfs	370 cfs
Velocity	1.45 ft/sec	3.14 ft/sec
Depth	6.39 feet	1.5 feet
Width	31.18 feet Top Width	78.78 feet Average Width
Roughness (Manning)	n=0.0444	n=0.027
Slope	0.0003 (0.017 degrees)	0.0021 (0.12 degrees)
Station Number 11A080 Nisqually River @ McKenna		
Temperature	14.7 ^oC	
CBOD	10 mg/L (best guess)	
pH (high)	7.8	
pH (low)	7.1	
Dissolved Oxygen	9.8 mg/L	
Station Number 11A070 Nisqually River @ Nisqually		
NBOD	4.57*(0.38 mg/L Ammonia + 5 mg/L Organic N typical value) = 24.6 mg/L	
Alkalinity	27 mg/L	
Hardness	22 mg/L as $CaCO_3$	
Cadmium	0.91 ug/L (total recoverable)	
Station Number 11A070 Nisqually River @ Nisqually		
Chromium	5 ug/L	
Lead	5 ug/L (total recoverable)	
Copper	7.5 ug/L (total recoverable)	

Mercury	0.12 ug/L (total recoverable)
Zinc	13 ug/L (total recoverable)
All Other Metals	0.0 (below detection limits)

BOD_5--This discharge with technology-based limitations results in a small amount of BOD loading relative to the large amount of dilution occurring in the receiving water at critical conditions. Technology-based limitations will be protective of dissolved oxygen criteria in the receiving water. The calculations used to determine dissolved oxygen impacts are shown in Appendix C.

Temperature and pH--The impact of pH and temperature were modeled using the calculations from EPA DESCON program, 1988. The input variables were a dilution factor of 130 for Outfall #002 and 4.0 for Outfall #003. Upstream temperature 14.7°C, upstream pH 7.1, upstream alkalinity 26 (as mg $CaCO_3$/L), effluent temperature 14°C, effluent pH of 5.7 as a worst case, and effluent alkalinity 90 (as mg $CaCO_3$/L) was an estimate for typical wastewaters. The calculations used to determine temperature and pH impacts are shown in Appendix C.

> Under critical conditions there was no predicted violation of the Surface Water Quality Standards. Therefore, the technology-based effluent limitations for pH was placed in the permit for Outfall #002 and temperature was not limited for either Outfall #002 or Outfall #003.
>
> Under critical conditions there was a prediction of a violation of the low end of the pH criteria for the receiving water at Outfall #003. Therefore the surface water quality criterion for pH for a class A receiving water was imposed for Outfall #003.

Fecal coliform bacteria -- This reach of the Nisqually River has been listed on the Ecology 1996 303(d) list as impaired for fecal coliform bacteria. Therefore the surface water criterion for fecal coliform for a class A (excellent) receiving water was imposed for Outfall #002 and Outfall #003 instead of the technology-based limitation for fecal coliforms.

> Testing for fecal coliform bacteria will not be required as long as each daily result from the total coliform bacteria test for the effluent is less than the monthly average permit limit set for fecal coliform. When any result for total coliform exceeds the monthly limit for fecal coliform, the fecal coliform test shall be performed a minimum of twice a week until each result from the last 7 test for total coliform are less than the fecal coliform monthly limit.
>
> In order to reduce the number of test performed at the facility the total coliform test results will be used to show compliance with the fecal coliform limit. This was deemed appropriate since fecal coliforms are a subset of total coliforms and the limit set for total coliforms is 45 times lower than the fecal limit. However, if the total coliform count rose above the monthly fecal limit then both a fecal and total coliform test would have to be performed until the total coliform count was less than the monthly average fecal limit for seven consecutive test.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require NPDES permits to contain effluent limits for toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. This process occurs concurrently with the derivation of technology-based effluent limits. Facilities with technology-based effluent limits defined in regulation are not exempted from meeting the Water Quality Standards for Surface Waters or from having surface water quality-based effluent limits.

The following toxics were determined to be present in the discharge: chlorine, ammonia, and heavy metals. A reasonable potential analysis (See Appendix C) was conducted on these parameters to determine whether or not effluent limitations would be required in this permit.

The determination of the reasonable potential for chlorine, ammonia, and heavy metals to exceed the water quality criteria was evaluated with procedures given in EPA, 1991 (Appendix C) at the critical condition. The critical condition in this case occurs from August 1, to September 30. The parameters used in the critical condition modeling are as follows: acute dilution factor was 130 for Outfall #002 and 4.0 for Outfall #003, chronic dilution factor was 130 for Outfall #002 and 19.4 for Outfall #003, receiving water temperature 14.7^{o}C, receiving water alkalinity 22 (as mg $CaCO_3$/L). The background concentration for chlorine was assumed to be zero, and the background concentration for ammonia was found to be 0.02 mg/L.

The determination of reasonable potential of total chlorine residual and ammonia to exceed the water quality criteria was conducted using receiving water information and waste discharge conditions that represent the highest potential for toxicity in the receiving water environment. Under these critical conditions there was no predicted violation of the Surface Water Quality Standards for total residual chlorine or ammonia from Outfall #002 or Outfall #003.

Chlorine Outfall #002 - Under critical conditions there was no predicted violation of the Surface Water Quality Standards for total residual chlorine. Therefore, the technology-based effluent limitation for total residual chlorine was placed in the permit. The technology-based monthly average limitation for chlorine is derived from standard operating practices. The Water Pollution Control Federation's Chlorination of Wastewater (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/liter chlorine residual is maintained after fifteen minutes of contact time. See also Metcalf and Eddy, Wastewater Engineering, Treatment, Disposal and Reuse, Third Edition, 1991. A treatment plant that provides adequate chlorination contact time can meet the 0.5 mg/liter chlorine limit on a monthly average basis. According to WAC 173-221-030(11)(b), the corresponding weekly average is 0.75 mg/liter. In addition total available (residual) chlorine shall be minimized. Residual chlorine discharged to the power canal shall not exceed the amount required to achieve the fecal coliform limit for the power canal discharge.

Chlorine Outfall #003 - Surface water quality limits calculated for total residual chlorine were below the technology limits described for Outfall #002. Therefore the calculated water quality limits will be imposed along with the requirement not to exceed the amount of total residual chlorine required to achieve the fecal coliform limit for the bypass reach of the Nisqually River.

Ammonia - Under critical conditions there was no predicted violation of the Surface Water Quality Standards for ammonia. According to the facilities plan the new SBR facility is expected to produce an effluent with an ammonia nitrogen concentration of 3 mg/L or less. Therefore the monthly average limit of 3 mg/L for ammonia nitrogen imposed on Outfall #002 and #003 will be based on the expected performance of the new facility as stated in the facilities plan.

Heavy Metals - Background concentrations for heavy metals were obtained from Station 11A070 (RM 3.4) some 18.4 miles downstream from the discharge location. A reasonable determination using background data from this downstream station and effluent data from the old lagoon treatment system showed that total recoverable background concentrations for Cadmium, Copper, Lead and Mercury were above the surface water quality standards and that Zinc showed a reasonable potential to violate standards. Since the plant is going through a major upgrade to include coagulation and flocculation followed by filtration it should be expected that the effluent concentration for heavy metals would be less than with the lagoon system. Since background data for total recoverable heavy metals could only be found at a station 18.4 miles downstream no limits for heavy metals will be placed in this permit and a

receiving water study will be required to get a better measure of background concentrations above the outfall during the critical period.

HUMAN HEALTH

Washington's water quality standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the state by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

The Department has determined that the applicant's discharge is unlikely to contain chemicals regulated for human health, and thus will not be regulated for human health based criteria. The discharge will be re-evaluated for impacts to human health at the next permit issuance.

GROUND WATER QUALITY LIMITATIONS FOR SURFACE PERCOLATION

The Department believes the Permittee's discharge has the potential to impact ground water quality and has imposed the following conditions in the proposed permit:

A. Ground Water Monitoring

At least one upgradient well is necessary to characterize background water quality. Downgradient wells will be determined based on the designated point of compliance, and the hydrogeologic characteristics of the site. Compliance wells must be located hydraulically downgradient of the discharge and must be reflective of the activity's impacts to ground water quality.

B. Monitoring Requirements

Ground water monitoring is required to establish background conditions and to demonstrate compliance with ground water recharge criteria. Ground water will be sampled from the approved monitoring wells at sites where reclaimed water will be used to recharge ground water. Field parameters are required to be monitored in order to assess the general condition of ground water and to determine when enough water has been purged from the borehole so that a representative water sample may be collected from the aquifer. The nitrogen species, bacteria, chloride, total dissolved solids and total metals are all contaminants that are commonly found in domestic wastewater. Trihalomethanes are a chlorine disinfection by-product. The major cations and anions provide a chemical characterization of ground water quality and are used as a tool to determine the impacts from a discharge. The following parameters will be monitored quarterly: static water level, pH, temperature, dissolved oxygen, conductivity, nitrate-nitrogen, nitrite, total Kjeldahl nitrogen, total dissolved solids, total coliform bacteria, chloride and total trihalomethanes. The major ions and total metals are required to be monitored on a yearly basis. Purging of the monitoring wells and ground water sampling shall follow the protocol described in Chapter 5 of Ecology's *Implementation Guidance for the Ground Water Quality Standards* (Publication #96-02).

C. Ground Water Limitations

The ground water limitations are established in accordance with RCW 90.46 and the *Water Reclamation and Reuse Standards* (publication #97-23). Ground water recharge criteria are the contaminant criteria found in the drinking water standards.

D. Ground Water Conditions

There are three main aquifers in the Yelm area which are separated by less permeable aquitards. These units include the recessional outwash aquifer, the upper aquitard, the advance outwash aquifer, the lower aquitard and deep aquifer. The recessional outwash aquifer is the uppermost aquifer and is the ground water reservoir which will be impacted first by surface activities. Ground water monitoring focuses on this uppermost aquifer to assess impacts. The recessional outwash was deposited by glacier meltwater as the Vashon glacier retreated and consists of loose mixtures of sand and gravel. The deposits are nearly continuous beneath the study area and range up to 25 feet thick. This aquifer is recharged primarily by infiltrated precipitation. Generally the ground water flows in a northerly direction towards the Nisqually River; however, localized flow patterns will develop as a result of variations in infiltration and recharge.

Ambient ground water quality for the reuse sites is unknown. The City of Yelm is required to characterize background water quality as part of their permit requirements. Ground water quality for the area is generally good, but elevated nitrate-nitrogen concentrations have been attributed to septic systems and confined animal feeding operations. The City of Yelm is required to install monitoring wells as part of their permit requirements which will specifically assess the impacts of ground water recharge with reclaimed water on ground water quality.

Reclaimed water may be beneficially used for surface percolation provided the reclaimed water meets the ground water recharge criteria (drinking water quality standards) as measured in the ground water beneath or down gradient of the recharge project site. Reclaimed water used for ground water recharge shall be at all times of a quality that fully protects public health and the water quality of waters of the state.

> RCW 90.46.010 (10) "Ground water recharge criteria" means the contaminant criteria found in the drinking water quality standards adopted by the state board of health pursuant to chapter 43.20 RCW and the department of health pursuant to chapter 70.119A RCW.

The permit requires that ground water monitoring wells be installed and that a ground water monitoring program be developed in order to demonstrate compliance. During the initial sampling, background water quality and compliance with the ground water recharge criteria will be determined. If compliance with the ground water recharge criteria cannot be achieved, then additional treatment will be required.

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are required (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and the effluent limitations are being achieved.

The monitoring schedule is detailed in the proposed permit under Condition S.2. Specified monitoring frequencies take into account the quantity and variability of discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is

consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (July 1994) for a 1.0 MGD sequence batch reactor treatment system with filtration and disinfection.

LAB ACCREDITATION

With the exception of certain parameters the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories.* The laboratory at this facility is accredited for Ammonia SM 4500-NH_3 B+C, Biochemical Oxygen Demand SM 5210, Chlorine Total Residual SM 4500-Cl G, Dissolved Oxygen SM 4500-O G, pH SM 4500-H, Solids Total Suspended SM 2540 D, Fecal Coliforms 9222 D.

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The conditions of S3. are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 273-220-210).

PREVENTION OF FACILITY OVERLOADING

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the Permittee to take the actions detailed in proposed permit requirement S.4. to plan expansions or modifications before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants. Condition S.4. restricts the amount of flow.

OPERATION AND MAINTENANCE (O&M)

The proposed permit contains condition S.5. as authorized under RCW 90.48.110, WAC 173-220-150, Chapter 173-230 WAC, and WAC 173-240-080. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment.

RESIDUAL SOLIDS HANDLING

To prevent water quality problems the Permittee is required in permit condition S6. to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and State Water Quality Standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503. The disposal of other solid waste is under the jurisdiction of the Thurston County Health Department.

INDUSTRIAL USERS

This provision requires the POTW to submit annually a list of existing and proposed SIUs and PSIUs. This requirement is intended to update the Department on an annual basis of the status of industrial users in the POTW's service area, without requiring the POTW to go through the process of performing a formal Industrial User Survey. This provision is normally applied to POTWs not serving industrial or commercial users. Although this permit does not require performance of an Industrial User Survey, the Permittee is nevertheless required to take adequate continuous routine measures to identify existing and new industrial discharges.

OUTFALL EVALUATION

Proposed permit condition S.8. requires the Permittee to conduct daily inspections of all public impoundment's and uses of reclaimed water and monthly inspections of the outfall locations located on the Centralia Power Canal and Nisqually River. These inspections shall be noted on the monthly DMRs submitted to the Department. The purpose of the inspection is to determine the condition of the discharge pipe and diffusers and to determine if sediment is accumulating in the vicinity of the outfall.

WATER RECLAMATION AND REUSE

Section S10 of the permit contains conditions by which Yelm shall comply to be able to distribute reclaimed water. The conditions were developed in coordination with the state Department of Health to satisfy reclaimed water use and other related regulations of Chapters 90.46 RCW, 90.03 RCW, 90.44 RCW, and 90.48 RCW.

The water reuse plan required by the permit will address potential uses for the reclaimed water. The plan will also address public health issues with the system and surface water and ground water quality issues with proposed reuse sites. Each reuse site not under the direct control of the Permittee requires a binding agreement between the Permittee and the user which addresses construction, operation and maintenance, and monitoring of the site.

Cochrane Park Wetlands

The wetlands and fish pond at Cochrane Park are a utilization of the reclaimed water that provides an aesthetic value to the community and an educational opportunity for the City's students. The wetland and pond system also provides detention of the reclaimed water to allow natural treatment processes to act on the water prior to infiltration into the ground.

Constructed beneficial use and constructed treatment wetlands that are designed to receive reclaimed water must be incorporated within a locally adopted and state approved sewer or water comprehensive plan. Note: These planning documents may also be referred to as general sewer plans (WAC 173-240-050), facilities plans (40 CFR 35.2030), or water system plans and project reports (WAC 246-290).

Irrigation

Management approaches for irrigation projects are directed to ensure irrigation water is used in a responsible manner and protects drinking water supplies. A project should be designed to utilize spray irrigation during times when possible human exposure is least likely to happen. While the reclaimed

water is safe for direct exposure, irrigation during night and early morning hours ensures limited public contact and helps curb public perception issues with the reclaimed water.

Reclaimed water that is delivered to existing irrigation systems must include provisions for testing and a site survey be conducted to identify any faucet or hose bib that could be used for drinking water. Dye testing of existing systems to verify that no connection with potable water supplies is possible is a good design practice.

Infiltration

The basic water quality requirement in RCW 90.46.080 for infiltration projects is that the reclaimed water must meet the groundwater recharge criteria (specifically, the contaminant criteria found in state drinking water quality standards) as measured in groundwater beneath or down-gradient of the recharge project site. The infiltration of reclaimed water for the purposes of ground water replenishment must also be incorporated within a locally adopted and state approved sewer or water comprehensive plan. Note: These planning documents may also be referred to as general sewer plans (WAC 173-240-050), facilities plans (40 CFR 35.2030), or water system plans and project reports (WAC 246-290).

RECEIVING WATER STUDY

Proposed permit condition S9. requires a receiving water study to gather info to determine if the effluent has a reasonable potential to cause a violation of the water quality standards.

Dissolved Oxygen - The receiving water near the outfall will need to be sampled for BOD_5, Total Kjedahl Nitrogen (TKN), dissolved oxygen, and temperature to determine if there is the potential for a violation of dissolved oxygen standard. Since the facility is undergoing a major upgrade new effluent data will need to be collected to determine the potential for the effluent to cause a violation of the dissolved oxygen standard.

Ammonia - The receiving water near the outfall shall also be sampled for total ammonia, pH and temperature to determine the potential for the effluent to cause a violation of the water quality standards for total ammonia.

pH - Alkalinity will be tested to determine whether the water quality or technology based standard for pH should apply to the discharge.

GENERAL CONDITIONS

General Conditions are based directly on state and federal law and regulations and have been standardized for all individual municipal NPDES permits issued by the Department.

PERMIT ISSUANCE PROCEDURES

PERMIT MODIFICATIONS

The Department may modify this permit to impose numerical limitations, if necessary to meet Water Quality Standards, Sediment Quality Standards, or Ground Water Standards, based on new information obtained from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

The Department may also modify this permit as a result of new or amended state or federal regulations.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to protect human health, aquatic life, and the beneficial uses of waters of the state of Washington. The Department proposes that this permit be issued for five years.

REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

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1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

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Metcalf and Eddy.

1991. Wastewater Engineering, Treatment, Disposal, and Reuse. Third Edition.

Tsivoglou, E.C., and J.R. Wallace.

1972. Characterization of Stream Reaeration Capacity. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

1994. Permit Writer's Manual. Publication Number 92-109

Water Pollution Control Federation.

1976. Chlorination of Wastewater.

Wright, R.M., and A.J. McDonnell.

1979. In-stream Deoxygenation Rate Prediction. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page 1 of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

Public notice of application was published on August 30, 1998, in the Daily Olympian to inform the public that an application had been submitted and to invite comment on the reissuance of this permit.

The Department will publish a Public Notice of Draft (PNOD) August 13, 1999, in the Nisqually Valley News, and September 5, 1999, in the Daily Olympian to inform the public that a draft permit and fact sheet are available for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

Water Quality Permit Coordinator
Department of Ecology
Southwest Regional Office
P.O. Box 47775
Olympia, WA 98504-7775.

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the thirty (30) day comment period to the address above. The request for a hearing shall indicate the interest of the party and the reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-220-090). Public notice regarding any hearing will be circulated at least thirty (30) days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing (WAC 173-220-100).

The Department will consider all comments received within thirty (30) days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, (360) 407-6275, or by writing to the address listed above.

This permit and fact sheet were written by Glenn Pieritz .

APPENDIX B--GLOSSARY

Acute Toxicity--The lethal effect of a pollutant on an organism that occurs within a short period of time, usually 48 to 96 hours.

AKART-- An acronym for "all known, available, and reasonable methods of prevention, control, and treatment".

Ambient Water Quality--The existing environmental condition of the water in a receiving water body.

Ammonia--Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Average Monthly Discharge Limitation --The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month (except in the case of fecal coliform). The daily discharge is calculated as the average measurement of the pollutant over the day.

Average Weekly Discharge Limitation -- The highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week. The daily discharge is calculated as the average measurement of the pollutant over the day.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass--The intentional diversion of waste streams from any portion of a treatment facility.

Chlorine--Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic Toxicity--The effect of a pollutant on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean Water Act (CWA)--The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Combined Sewer Overflow (CSO)--The event during which excess combined sewage flow caused by inflow is discharged from a combined sewer, rather than conveyed to the sewage treatment plant because either the capacity of the treatment plant or the combined sewer is exceeded.

Compliance Inspection - Without Sampling--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling--A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the percent removal requirement. Additional sampling may be conducted.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing a minimum of four discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots.

Construction Activity--Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Critical Condition--The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Dilution Factor--A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the effluent fraction e.g., a dilution factor of 10 means the effluent comprises 10 percent by volume and the receiving water 90 percent.

Engineering Report--A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal Coliform Bacteria--Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial User-- A discharger of wastewater to the sanitary sewer which is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Infiltration and Inflow (I/I)--"Infiltration" means the addition of ground water into a sewer through joints, the sewer pipe material, cracks, and other defects. "Inflow" means the addition of precipitation-caused drainage from roof drains, yard drains, basement drains, street catch basins, etc., into a sewer.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal and;

Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including state regulations contained in any state sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Major Facility--A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum Daily Discharge Limitation--The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

Minor Facility--A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing Zone--A volume that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in state regulations (Chapter 173-201A WAC).

National Pollutant Discharge Elimination System (NPDES)--The NPDES (Section 402 of the Clean Water Act) is the Federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both State and Federal laws.

Pass through -- A discharge which exits the POTW into waters of the state in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of state water quality standards.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Potential Significant Industrial User--A potential significant industrial user is defined as an Industrial User which does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 percent of treatment plant design capacity criteria and discharges <25,000 gallons per day or;

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

The Department may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation Level (QL)-- A calculated value five times the MDL (method detection level).

Significant Industrial User (SIU)--

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

   Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

   *The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

State Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, wetlands, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)--Total suspended solids are the particulate materials in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset--An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water Quality-based Effluent Limit--A limit on the concentration or mass of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into a receiving water.

APPENDIX C--TECHNICAL CALCULATIONS

Several of the Excel® spreadsheet tools used to evaluate a dischargers ability to meet Washington State water quality standards can be found on the Department's homepage at http.www:wa.gov.ecology.

Dec 21, 1998, 10: 5:36 WED PROGRAM PLUMES, Ed 3.1, 8/7/95 Case: 1 of 1

Title **Yelm, Nisqually Outfall #003, 1.0 MGD**

nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.04381	1	0.04381	1000	0.0	19.4	9.19	91.9

port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
0.3048	0.1778	0.1590	2.206	2.206	0.000	0.10	25

port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.1270	0.0	0.8	-1.61079	100	0	52.71	1749000

hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	1000.0	-0.490106	0.9449	0.0003	0.9449	2.334	0.02590

depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.9449	-0.545735	0	12.9	0	0.04232	0.01101
0.4328	0.9449	-0.466745	0	12.25	0	buoy flux	puff-ther
						4.823E-07	2.736
						jet-plume	jet-cross
						7.892	0.3290
						plu-cross	jet-strat
						0.0005717	2.710
						plu-strat	
						1.588	
						hor dis =	

Dec 23, 1998, 10:17:34 WED PROGRAM PLUMES, Ed 3.1, 8/7/95 Case: 1 of 1

Title **^ZSYelm, Nisqually Outfall #003, 1.0 MGD**

nonlinear

tot flow	# ports	port flow	spacing	effl sal	effl temp	far inc	far dis
0.08762	1	0.08762	0.8636	0.0	19.4	9.19	91.9

port dep	port dia	plume dia	total vel	horiz vel	vertl vel	asp coeff	print frq
12.00	0.2514	0.2249	2.206	2.206	0.000	0.10	25

port elev	ver angle	cont coef	effl den	poll conc	decay	Froude #	Roberts F
0.1270	0.0	0.8	-1.61079	100	0	44.67	766.4

hor angle	red space	p amb den	p current	far dif	far vel	K:vel/cur	Stratif #
90	0.8636	-0.506240	0.9449	0.0003	0.9449	2.335	0.0006700

depth	current	density	salinity	temp	amb conc	N (freq)	red grav.
0.0	0.9449	-0.545735	0	12.9	0	0.005683	0.01085

24	0.9449	-0.466745	0	12.25	0	buoy flux	puff-ther
						0.001101	3.465
						jet-plume	jet-cross
						9.456	0.4653
						plu-cross	jet-strat
						0.001127	8.796
						plu-strat	
						8.484	

hor dis =

CORMIX1 flow category algorithm is turned off.

1 1 to any range

Help: F1. Quit: <esc>. Configuration:NTNO0. FILE: YELM.VAR;

UM INITIAL DILUTION CALCULATION (nonlinear mode)

plume depth	plume dia.	poll conc	avg. plume dil.	CL conc	*CL dil.	hor dis	
m	m					m	
12.50	0.2249	100.0	1.000	100.0	1.000	0.000	
12.50	0.2553	84.67	1.181	100.0	1.000	0.1215	-> bottom hit
12.50	0.2567	84.09	1.189	100.0	1.000	0.1269	-> bottom hit
12.50	0.2925	70.71	1.414	100.0	1.000	0.2739	-> bottom hit
12.50	0.3321	59.46	1.681	100.0	1.000	0.4506	-> bottom hit
12.50	0.3757	50.00	1.999	100.0	1.000	0.6641	-> bottom hit
12.50	0.4234	42.05	2.377	100.0	1.000	0.9240	-> bottom hit
12.50	0.4756	35.36	2.826	93.75	1.066	1.242	-> bottom hit
12.50	0.5324	29.73	3.361	81.24	1.230	1.635	-> bottom hit
12.50	0.5943	25.00	3.996	70.39	1.419	2.123	-> bottom hit
12.49	0.6614	21.02	4.752	60.97	1.638	2.733	-> bottom hit

```
12.49   0.7342     17.68   5.651   52.76   1.894   3.498  -> bottom hit
12.49   0.8132     14.87   6.721   45.61   2.191   4.465  -> bottom hit
12.49   0.8672     13.30   7.509   40.11   2.490   5.217  -> bottom hit
-> surface reflection begins
12.48   0.9029     12.50   7.992   35.07   2.849   5.763  -> bottom hit
12.47   1.030   10.51   9.504   26.91   3.712   7.877  -> bottom hit
12.46   1.099   9.810   10.26   24.61   4.111   9.190  -> bottom hit
12.45   1.194   8.839   11.30   21.41   4.665   11.01  -> bottom hit
12.42   1.400   7.433   13.44   17.34   5.761   15.48  -> bottom hit
12.36   1.652   6.250   15.98   14.22   7.024   21.61  -> bottom hit
12.27   1.959   5.256   19.01   11.76   8.496   29.48  -> bottom hit
12.15   2.330   4.420   22.60   9.785   10.21   39.08  -> bottom hit
11.99   2.775   3.716   26.88   8.177   12.22   50.54  -> bottom hit
11.77   3.309   3.125   31.96   6.853   14.57   64.10  -> bottom hit
11.51   3.946   2.628   38.01   5.754   17.36   80.15  -> bottom hit
11.31   4.415   2.370   42.44   5.190   19.39   91.90  -> bottom hit
11.18   4.707   2.210   45.20   4.838   20.65   99.22  -> bottom hit
10.77   5.614   1.858   53.76   4.071   24.54   122.0  -> bottom hit
10.28   6.694   1.563   63.93   3.427   29.16   149.5  -> bottom hit
9.686   7.980   1.314   76.02   2.885   34.62   183.3  -> bottom hit
8.973   9.511   1.105   90.41   2.429   41.13   225.7  -> bottom hit
8.198   11.17   0.9421     106.0   2.074   48.15   276.1  -> trap level
8.124   11.33   0.9291     107.5   2.045   48.84   281.2  -> bottom hit
7.130   13.50   0.7813     127.9   1.722   58.03   361.3  -> bottom hit
6.916   13.98   0.7547     132.4   1.664   60.05   383.0  -> bank(s)reach

CL dilution = (poll conc/CL conc) x avg. plume dilution
```

Spread of a plume from a point source in a river with boundary effects from the shoreline based on the method of Fischer et al. (1979) with correction for the effective origin of effluent.

Revised 22-Feb-96

INPUT	Chronic	Acute
1. Effluent Discharge Rate (cfs):	1.55	1.55
2. Receiving Water Characteristics Downstream From Waste Input		
Stream Depth (ft):	5.84	5.84
Stream Velocity (fps):	1.45	1.45
Stream Flow (cfs):	200.00	200.00
Channel Width (ft):	23.62	23.62
Stream Slope (ft/ft) or Manning roughness "n":	0.0003	0.0003
0 if slope or 1 if Manning "n" in previous cell:	0	0
3. Discharge Distance From Nearest Shoreline (ft):	0	0
4. Location of Point of Interest to Estimate Dilution		
Distance Downstream to Point of Interest (ft):	16051.2	1605.12
Distance From Nearest Shoreline (ft):	0	0
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6	0.6
6. Original Fischer Method (enter 0) or *Effective Origin* Modification (enter	0	0
OUTPUT		
1. Source Conservative Mass Input Rate		
Concentration of Conservative Substance (%):	100.00	100.00
Source Conservative Mass Input Rate (cfs*%):	154.73	154.73
2. Shear Velocity		
Shear Velocity based on slope (ft/sec):	0.238	0.238
Shear Velocity based on Manning "n":		
using Prasuhn equations 8-26 and 8-54 assuming hydraulic radius equals depth for wide channel		
Darcy-Weisbach friction factor "f":	#N/A	#N/A
Shear Velocity from Darcy-Weisbach "f" (ft/sec):	#N/A	#N/A
Selected Shear Velocity for next step (ft/sec):	0.238	0.238
3. Transverse Mixing Coefficient (ft2/sec):	0.832	0.832
4. Plume Characteristics Accounting for Shoreline Effect (Fischer *et al.*.		
Co	7.74E-01	7.74E-01
x'	1.65E+01	1.65E+00
v'o	0.00E+00	0.00E+00
v' at point of interest	0.00E+00	0.00E+00
Solution using superposition equation (Fischer eqn 5.9)		
Term for n= -2	1.57E+00	1.77E-01
Term for n= -1	1.88E+00	1.09E+00
Term for n= 0	2.00E+00	2.00E+00
Term for n= 1	1.88E+00	1.09E+00
Term for n= 2	1.57E+00	1.77E-01
Upstream Distance from Outfall to *Effective Origin* of Effluent Source	#N/A	#N/A
Effective Distance Downstream from Effluent to Point of Interest (ft)	16051.20	1605.12
x' Adjusted for *Effective Origin*	1.65E+01	1.65E+00
C/Co (dimensionless)	6.18E-01	9.96E-01
Concentration at Point of Interest (Fischer Eqn 5.9)	4.78E-01	7.71E-01
Unbounded Plume Width at Point of Interest (ft)	542.968	171.702
Unbounded Plume half-width (ft)	271.484	85.851
Distance from near shore to discharge point (ft)	0.00	0.00
Distance from far shore to discharge point (ft)	23.62	23.62
Plume width bounded by shoreline (ft)	23.62	23.62
Approximate Downstream Distance to Complete Mix (ft):	389	389
Theoretical Dilution Factor at Complete Mix:	129.264	129.264
Calculated Flux-Average Dilution Factor Across Entire Plume Width:	129.264	129.264
Calculated Dilution Factor at Point of Interest:	209.118	129.760
$(0.025*Q_{stream} + Q_{effluent})/Q_{effluent}$	4.231	4.231
$(0.25*Q_{stream} + Q_{effluent})/Q_{effluent}$	33.314	33.314
$(Q_{stream} + Q_{effluent})/Q_{effluent}$	**130.254**	**130.254**

Calculation of pH of a mixture of two flows. Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

Based on Lotus File PHMIX2.WK1 Revised 19-Oct-93

Notes: City of Yelms Power Canal Outfall #002

INPUT

1. DILUTION FACTOR AT MIXING ZONE BOUNDARY	130.000
1. UPSTREAM/BACKGROUND CHARACTERISTICS	
Temperature (deg C):	14.70
pH:	7.10
Alkalinity (mg CaCO3/L):	26.00
2. EFFLUENT CHARACTERISTICS	
Temperature (deg C):	14.00
pH:	5.70
Alkalinity (mg CaCO3/L):	90.00

OUTPUT

1. IONIZATION CONSTANTS	
Upstream/Background pKa:	6.42
Effluent pKa:	6.43
2. IONIZATION FRACTIONS	
Upstream/Background Ionization Fraction:	0.83
Effluent Ionization Fraction:	0.16
3. TOTAL INORGANIC CARBON	
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	31.46
Effluent Total Inorganic Carbon (mg CaCO3/L):	571.46
4. CONDITIONS AT MIXING ZONE BOUNDARY	
Temperature (deg C):	14.69
Alkalinity (mg CaCO3/L):	26.49
Total Inorganic Carbon (mg CaCO3/L):	35.62
pKa:	6.42
pH at Mixing Zone Boundary:	6.89

Calculation of pH of a mixture of two flows. Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

Based on Lotus File PHMIX2.WK1 Revised 19-Oct-93

Notes: City of Yelms Nisqually River Outfall #003

INPUT

1. DILUTION FACTOR AT MIXING ZONE BOUNDARY	4.000
1. UPSTREAM/BACKGROUND CHARACTERISTICS	
Temperature (deg C):	14.70
pH:	7.10
Alkalinity (mg CaCO3/L):	26.00
2. EFFLUENT CHARACTERISTICS	
Temperature (deg C):	14.00
pH:	5.70
Alkalinity (mg CaCO3/L):	90.00

OUTPUT

1. IONIZATION CONSTANTS	
Upstream/Background pKa:	6.42
Effluent pKa:	6.43
2. IONIZATION FRACTIONS	
Upstream/Background Ionization Fraction:	0.83
Effluent Ionization Fraction:	0.16
3. TOTAL INORGANIC CARBON	
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	31.46
Effluent Total Inorganic Carbon (mg CaCO3/L):	571.46
4. CONDITIONS AT MIXING ZONE BOUNDARY	
Temperature (deg C):	14.53
Alkalinity (mg CaCO3/L):	42.00
Total Inorganic Carbon (mg CaCO3/L):	166.46
pKa:	6.42
pH at Mixing Zone Boundary:	5.95

Streeter-Phelps analysis of critical dissolved oxygen sag.

Based on Lotus File DOSAG2.WK1 Revised 19-Oct-93

Notes: City of Yelms Power Canal Outfall #002

INPUT

1. EFFLUENT CHARACTERISTICS

Discharge (cfs):	1.547
CBOD5 (mg/L):	45
NBOD (mg/L):	301.62
Dissolved Oxygen (mg/L):	1.1
Temperature (deg C):	23

2. RECEIVING WATER CHARACTERISTICS

Upstream Discharge (cfs):	200
Upstream CBOD5 (mg/L):	10.0
Upstream NBOD (mg/L):	24.5866
Upstream Dissolved Oxygen (mg/L):	9.8
Upstream Temperature (deg C):	14.7
Elevation (ft NGVD):	250
Downstream Average Channel Slope (ft/ft):	0.0003
Downstream Average Channel Depth (ft):	5.84
Downstream Average Channel Velocity (fps):	1.45

3. REAERATION RATE (Base e) AT 20 deg C (day^-1): 21.84

Reference	Applic. Vel (fps)	Applic. Dep (ft)	Suggested Values
Churchill	1.5 - 6	2 - 50	0.87
O'Connor and Dobbins	.1 - 1.5	2 - 50	1.11
Owens	.1 - 6	1 - 2	1.06
Tsivoglou-Wallace	.1 - 6	.1 - 2	1.80

4. BOD DECAY RATE (Base e) AT 20 deg C (day^-1): 0.57

Reference	Suggested Value
Wright and McDonnell, 1979	0.77

OUTPUT

1. INITIAL MIXED RIVER CONDITION

CBOD5 (mg/L):	10.3
NBOD (mg/L):	26.7
Dissolved Oxygen (mg/L):	9.7
Temperature (deg C):	14.8

2. TEMPERATURE ADJUSTED RATE CONSTANTS (Base e)

Reaeration (day^-1):	19.29
BOD Decay (day^-1):	0.45

3. CALCULATED INITIAL ULTIMATE CBODU AND TOTAL BODU

Initial Mixed CBODU (mg/L):	15.1
Initial Mixed Total BODU (CBODU + NBOD, mg/L):	41.8

4. INITIAL DISSOLVED OXYGEN DEFICIT

Saturation Dissolved Oxygen (mg/L):	10.045
Initial Deficit (mg/L):	0.31

5. TRAVEL TIME TO CRITICAL DO CONCENTRATION (days):	0.18
6. DISTANCE TO CRITICAL DO CONCENTRATION (miles):	4.26
7. CRITICAL DO DEFICIT (mg/L):	0.90
8. CRITICAL DO CONCENTRATION (mg/L):	9.15

Streeter-Phelps analysis of critical dissolved oxygen sag.

Based on Lotus File DOSAG2.WK1 Revised 19-Oct-93

Notes: City of Yelms Nisqually River Outfall #003

INPUT

1. EFFLUENT CHARACTERISTICS

Discharge (cfs):	1.547
CBOD5 (mg/L):	45
NBOD (mg/L):	301.62
Dissolved Oxygen (mg/L):	1.1
Temperature (deg C):	23

2. RECEIVING WATER CHARACTERISTICS

Upstream Discharge (cfs):	370
Upstream CBOD5 (mg/L):	10.0
Upstream NBOD (mg/L):	24.5866
Upstream Dissolved Oxygen (mg/L):	9.8
Upstream Temperature (deg C):	14.7
Elevation (ft NGVD):	250
Downstream Average Channel Slope (ft/ft):	0.0021
Downstream Average Channel Depth (ft):	1.5
Downstream Average Channel Velocity (fps):	3.14

3. REAERATION RATE (Base e) AT 20 deg C (day^-1): 21.84

Reference	Applic. Vel (fps)	Applic. Dep (ft)	Suggested Values
Churchill	1.5 - 6	2 - 50	17.84
O'Connor and Dobbins	.1 - 1.5	2 - 50	12.50
Owens	.1 - 6	1 - 2	21.96
Tsivoglou-Wallace	.1 - 6	.1 - 2	27.32

4. BOD DECAY RATE (Base e) AT 20 deg C (day^-1): 0.57

Reference	Suggested Value
Wright and McDonnell, 1979	0.57

OUTPUT

1. INITIAL MIXED RIVER CONDITION

CBOD5 (mg/L):	10.1
NBOD (mg/L):	25.7
Dissolved Oxygen (mg/L):	9.8
Temperature (deg C):	14.7

2. TEMPERATURE ADJUSTED RATE CONSTANTS (Base e)

Reaeration (day^-1):	19.28
BOD Decay (day^-1):	0.45

3. CALCULATED INITIAL ULTIMATE CBODU AND TOTAL BODU

Initial Mixed CBODU (mg/L):	14.9
Initial Mixed Total BODU (CBODU + NBOD, mg/L):	40.7

4. INITIAL DISSOLVED OXYGEN DEFICIT

Saturation Dissolved Oxygen (mg/L):	10.052
Initial Deficit (mg/L):	0.29

5. TRAVEL TIME TO CRITICAL DO CONCENTRATION (days):	0.18
6. DISTANCE TO CRITICAL DO CONCENTRATION (miles):	9.30
7. CRITICAL DO DEFICIT (mg/L):	0.87
8. CRITICAL DO CONCENTRATION (mg/L):	9.18

Determining the Requirement for Permit Limits Through a Reasonable Potential Determination to Violate Standards at the Edge of the Mixing Zone.

Based on EPA/505/2-90-001

Notes: City of Yelms Power Canal Outfall #002 - Reasonable potential determination to violate the surface water quality standard for total residual chlorine.

INPUT	
Confidence Level and Probability Basis:	**0.95**
Coefficient of Variation for the Effluent Concentration (CV) (0.6 or a calculated CV if there are more than 10 data points):	**0.56045313**
Number of Effluent Samples or Data Points (ND):	**1126**
Highest Effluent Concentration or Value (HV):	**0.11**
Dilution Factors (1/{Effluent Volume Fraction}) or plumes model	
Acute Receiving Water Dilution Factor:	**130**
Chronic Receiving Water Dilution Factor:	**130**
Water Quality Standards (Concentration)	
Acute (one-hour) Criteria:	**0.019**
Chronic (n-day) Criteria:	**0.011**
Upstream Receiving Water Concentration:	
Upstream Concentration for Acute Condition (7Q10):	**0**
Upstream Concentration for Chronic Condition (7Q10):	**0**
MECB: 1-9 data points, highest value by 2; 10-50 the highest value; >50 calculate 90th %-tile	

OUTPUT	
Percentile Represented by the Highest Concentration in Data Set (p_n) = (1 - confidence level)^1/ND	0.997343028
Normal Distribution Value for 95th Percentile	1.644853
Normal Distribution Value for 100th Percentile	2.787346602
$\sigma^2 = \ln(CV^2+1)$	0.273157889
C95 = exp(1.645Sigma -0.5Sigma^2)	2.060802352
C100 = exp(2.787Sigma -0.5Sigma^2)	3.744222812
Reasonable Potential Multiplier = C95/C100	0.6
Maximum Expected Concentration of Pollutant in Effluent (MEC):	0.060543475
Acute - Concentration of Pollutant at the Edge of the Mixing Zone (CP):	0.000465719
Chronic - Concentration of Pollutant at the Edge of the Mixing Zone (CP):	0.000465719
Resonable Potential to Violate Acute Criteria at the Edge of the Mixing Zone (RP):	**NO**

Resonable Potential to Violate Chronic Criteria at the Edge of the Mixing Zone (RP): **NO**

Determining the Requirement for Permit Limits Through a Reasonable Potential Determination to Violate Standards at the Edge of the Mixing Zone.

Based on EPA/505/2-90-001

Notes: City of Yelms Nisqually River Outfall #003- Reasonable potential determination to violate the surface water quality standard for total residual chlorine.

INPUT	
Confidence Level and Probability Basis:	**0.95**
Coefficient of Variation for the Effluent Concentration (CV) (0.6 or a calculated CV if there are more than 10 data points):	**0.56045313**
Number of Effluent Samples or Data Points (ND):	**1126**
Highest Effluent Concentration or Value (HV):	**0.11**
Dilution Factors (1/{Effluent Volume Fraction}) or plumes model	
Acute Receiving Water Dilution Factor:	**4**
Chronic Receiving Water Dilution Factor:	**19.4**
Water Quality Standards (Concentration)	
Acute (one-hour) Criteria:	**0.019**
Chronic (n-day) Criteria:	**0.011**
Upstream Receiving Water Concentration:	
Upstream Concentration for Acute Condition (7Q10):	**0**
Upstream Concentration for Chronic Condition (7Q10):	**0**
MECB: 1-9 data points, highest value by 2; 10-50 the highest value; >50 calculate 90th %-tile	

OUTPUT	
Percentile Represented by the Highest Concentration in Data Set (p_n) = (1 - confidence level)^1/ND	0.997343028
Normal Distribution Value for 95th Percentile	1.644853
Normal Distribution Value for 100th Percentile	2.787346602
$\sigma^2 = \ln(CV^2+1)$	0.273157889
C95 = exp(1.645Sigma -0.5Sigma^2)	2.060802352
C100 = exp(2.787Sigma -0.5Sigma^2)	3.744222812
Reasonable Potential Multiplier = C95/C100	0.6
Maximum Expected Concentration of Pollutant in Effluent (MEC):	0.060543475
Acute - Concentration of Pollutant at the Edge of the Mixing Zone (CP):	0.015135869
Chronic - Concentration of Pollutant at the Edge of the Mixing Zone (CP):	0.003120798
Resonable Potential to Violate Acute Criteria at the Edge of the Mixing Zone (RP):	**NO**

Resonable Potential to Violate Chronic Criteria at the Edge of the Mixing Zone (RP): **NO**

Water Quality-Based Permit Limits for Acute and Chronic Criteria.
(based on EPA/505/2-90-001 Box 5-2).

Based on Lotus File WQBP2.WK1 Revised 19-Oct-93

Notes: City of Yelms Nisqually River Outfall #003 - Daily and Monthly Limit for TRC

INPUT	
1. Water Quality Standards (Concentration)	
Acute (one-hour) Criteria:	**0.019**
Chronic (n-day) Criteria:	**0.011**
2. Upstream Receiving Water Concentration	
Upstream Concentration for Acute Condition (7Q10): 95th%-tile	**0.000**
Upstream Concentration for Chronic Condition (7Q10): 90th%-tile	**0.000**
3. Dilution Factors (1/{Effluent Volume Fraction}) or Plumes Model	
Acute Receiving Water Dilution Factor:	**4.000**
Chronic Receiving Water Dilution Factor:	**19.400**
4. Coefficient of Variation for Effluent Concentration	
(0.6 or a calculated CV if there are more than 10 data points):	**0.560**
5. Number of days (n1) for chronic average	
(usually four or seven; four is recommended):	**4**
6. Number of samples (n2) required per month for monitoring:	**180**

OUTPUT	
1. Z Statistics	
LTA Derivation (99%tile):	2.326
Daily Maximum Permit Limit (99%tile):	2.326
Monthly Average Permit Limit (95%tile):	1.645
2. Calculated Waste Load Allocations (WLA's)	
Acute (one-hour) WLA:	0.076
Chronic (n1-day) WLA:	0.213
3. Derivation of LTAs using April 1990 TSD (Box 5-2 Step 2 & 3)	
Sigma^2:	0.2732
Sigma^2-n1:	0.0756
LTA for Acute (1-hour) WLA:	0.026
LTA for Chronic (n1-day) WLA:	0.117
Most Limiting LTA (minimum of acute and chronic):	0.026
4. Derivation of Permit Limits From Limiting LTA (Box 5-2 Step 4)	
Sigma^2-n2:	0.0017
Daily Maximum Permit Limit:	**0.076**
Monthly Average Permit Limit:	**0.028**

Freshwater un-ionized ammonia criteria based on EPA Gold Book (EPA 440/5-86-001)
as revised by Heber and Ballentine (1992).

Based on Lotus File NH3FRES2.WK1 Revised 12-Dec-94

Notes: City of Yelm - Ammonia Surface Water Criteria

INPUT	
1. Temperature (deg C; 0<T<30): 90th%-tile	14.7
2. pH (6.5<pH<9.0): 90th%-tile	7.74
3. Total Ammonia (ug N/L):	0.0035
4. Acute TCAP (Salmonids present- 20; absent- 25):	20
5. Chronic TCAP (Salmonids present- 15; absent- 20):	15

OUTPUT	
1. Intermediate Calculations:	
Acute FT:	1.4421
Chronic FT:	1.4421
FPH:	1.1657
RATIO:	13.5000
pKa:	9.5724
Fraction Of Total Ammonia Present As Un-ionized:	1.4498%
2. Sample Un-ionized Ammonia Concentration (ug/L as NH3-N):	5.07416E-05
3. Un-ionized Ammonia Criteria:	
Acute (1-hour) Un-ionized Ammonia Criterion (mg/L as NH3-N):	0.127136233
Chronic (4-day) Un-ionized Ammonia Criterion (mg/L as NH3-N):	0.028976919
4. Total Ammonia Criteria:	
Acute Total Ammonia Criterion (mg/L as NH3-N):	**8.769462412**
Chronic Total Ammonia Criterion (mg/L as NH3-N):	**1.998737872**

Determining the Requirement for Permit Limits Through a Reasonable Potential Determination to Violate Standards at the Edge of the Mixing Zone.

Based on EPA/505/2-90-001

Notes: City of Yelms Power Canal Outfall #002 - Reasonable potential determination to violate the surface water quality standard for ammonia.

INPUT	
Confidence Level and Probability Basis:	**0.95**
Coefficient of Variation for the Effluent Concentration (CV) (0.6 or a calculated CV if there are more than 10 data points):	**0.78380605**
Number of Effluent Samples or Data Points (ND):	**14**
Highest Effluent Concentration or Value (HV):	**20**
Dilution Factors (1/{Effluent Volume Fraction}) or plumes model	
Acute Receiving Water Dilution Factor:	**130**
Chronic Receiving Water Dilution Factor:	**130**
Water Quality Standards (Concentration)	
Acute (one-hour) Criteria:	**8.77**
Chronic (n-day) Criteria:	**2.00**
Upstream Receiving Water Concentration:	
Upstream Concentration for Acute Condition (7Q10):	**0.02**
Upstream Concentration for Chronic Condition (7Q10):	**0.02**
MECB: 1-9 data points, highest value by 2; 10-50 the highest value; >50 calculate 90th %-tile	

OUTPUT	
Percentile Represented by the Highest Concentration in Data Set (p_n) = (1 - confidence level)^1/ND	0.807363824
Normal Distribution Value for 95th Percentile	1.644853
Normal Distribution Value for 81th Percentile	0.868221832
$\sigma^2 = \ln(CV^2+1)$	0.478933587
C95 = exp(1.645Sigma -0.5Sigma^2)	2.456786469
C81 = exp(0.868Sigma -0.5Sigma^2)	1.435317913
Reasonable Potential Multiplier = C95/C81	1.7
Maximum Expected Concentration of Pollutant in Effluent (MEC):	34.23334228
Acute - Concentration of Pollutant at the Edge of the Mixing Zone (CP):	0.283179556
Chronic - Concentration of Pollutant at the Edge of the Mixing Zone (CP):	0.283179556
Resonable Potential to Violate Acute Criteria at the Edge of the Mixing Zone (RP):	**NO**

Resonable Potential to Violate Chronic Criteria at the Edge of the Mixing Zone (RP): **NO**

Determining the Requirement for Permit Limits Through a Reasonable Potential Determination to Violate Standards at the Edge of the Mixing Zone.

Based on EPA/505/2-90-001

Notes: City of Yelms Nisqually River Outfall #003 - Reasonable potential determination to violate the surface water quality standard for ammonia.

INPUT	
Confidence Level and Probability Basis:	**0.95**
Coefficient of Variation for the Effluent Concentration (CV) (0.6 or a calculated CV if there are more than 10 data points):	**0.78380605**
Number of Effluent Samples or Data Points (ND):	**14**
Highest Effluent Concentration or Value (HV):	**20**
Dilution Factors (1/{Effluent Volume Fraction}) or plumes model	
Acute Receiving Water Dilution Factor:	**4**
Chronic Receiving Water Dilution Factor:	**19.4**
Water Quality Standards (Concentration)	
Acute (one-hour) Criteria:	**8.77**
Chronic (n-day) Criteria:	**2.00**
Upstream Receiving Water Concentration:	
Upstream Concentration for Acute Condition (7Q10):	**0.02**
Upstream Concentration for Chronic Condition (7Q10):	**0.02**
MECB: 1-9 data points, highest value by 2; 10-50 the highest value; >50 calculate 90th %-tile	

OUTPUT	
Percentile Represented by the Highest Concentration in Data Set (p_n) = (1 - confidence level)^1/ND	0.807363824
Normal Distribution Value for 95th Percentile	1.644853
Normal Distribution Value for 81th Percentile	0.868221832
$\sigma^2 = \ln(CV^2+1)$	0.478933587
C95 = exp(1.645Sigma -0.5Sigma^2)	2.456786469
C81 = exp(0.868Sigma -0.5Sigma^2)	1.435317913
Reasonable Potential Multiplier = C95/C81	1.7
Maximum Expected Concentration of Pollutant in Effluent (MEC):	34.23334228
Acute - Concentration of Pollutant at the Edge of the Mixing Zone (CP):	8.573335569
Chronic - Concentration of Pollutant at the Edge of the Mixing Zone (CP):	1.783574344
Resonable Potential to Violate Acute Criteria at the Edge of the Mixing Zone (RP):	**NO**

Resonable Potential to Violate Chronic Criteria at the Edge of the Mixing Zone (RP): **NO**

Determining the Requirement for Permit Limits Through a Reasonable Potential Determination to Violate Standards at the Edge of the Mixing Zone.

Based on EPA/505/2-90-001

Notes: City of Yelms Power Canal Outfall #002 - Reasonable potential determination to violate the surface water quality standard for heavy metals.

INPUT		Arsenic	Cadmiu	Chromium Hex	Chromium Tri	Copper	Lead	Mercur	Nickel	Seleniu	Silver	Zinc
Confidence Level and Probability Basis:		**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**0.95**
Coefficient of Variation for the Effluent Concentration (0.6 or a calculated CV if there are more than 10		**0.6**	**0.6**	**0.6**	**0.6**	**0.4061**	**2.5621**	**0.6**	**0.6**	**0.6**	**0.6**	**2.2560**
Number of Effluent Samples or Data Points (ND):		**0**	**3**	**0**	**0**	**29**	**26**	**3**	**0**	**0**	**3**	**28**
Highest Effluent Concentration or Value (HV):		**---**	**0**	**---**	**---**	**0.14**	**0.034**	**0**	**---**	**---**	**2E-06**	**1.72**
Dilution Factors (1/{Effluent Volume Fraction}) or												
Acute Receiving Water Dilution Factor:	**130**	**130**	**130**	**130**	**130**	**1**	**130**	**130**	**130**	**130**	**130**	**130**
Chronic Receiving Water Dilution Factor:	**130**	**130**	**1**	**130**	**130**	**1**	**1**	**1**	**130**	**130**	**130**	**130**
Water Quality Standards (Concentration)												
Acute (one-hour) Criteria:		**0.36**	**0.0007**	**0.015**	**0.5024**	**0.0042**	**0.0118**	**0.0021**	**0.3939**	**0.02**	**0.0003**	**0.0324**
Chronic (n-day) Criteria:		**0.19**	**0.0003**	**0.01**	**0.0598**	**0.0032**	**0.0004**	**1.2E-**	**0.0438**	**0.005**	**---**	**0.0293**
Upstream Receiving Water Concentration:												
Upstream Concentration for Acute Condition		**---**	**0.0004**	**0.0023**	**---**	**0.0061**	**0.005**	**0.0001**	**---**	**---**	**---**	**0.0079**
Upstream Concentration for Chronic Condition		**---**	**0.0004**	**0.0023**	**---**	**0.0061**	**0.005**	**0.0001**	**---**	**---**	**---**	**0.0079**
MECB: 1-9 data points, multiply highest value by 2: 10-50 use highest												
OUTPUT												
Percentile Represented by the Highest Concentration in (p$_n$) = (1 - confidence level)^1/ND		---	0.3684	---	---	0.9018	0.8911	0.3684	---	---	0.3684	0.8985
Normal Distribution Value for 95th Percentile		1.6448	1.6448	1.6448	1.6448	1.6448	1.6448	1.6448	1.6448	1.6448	1.6448	1.6448
Normal Distribution Value for XXth Percentile		---	-	---	---	1.2921	1.2327	-	---	---	-	1.2732
$s^2 = \ln(CV^2+1)$		0.3074	0.3074	0.3074	0.3074	0.1526	2.0235	0.3074	0.3074	0.3074	0.3074	1.8066
C95 = exp(1.645Sigma -0.5Sigma^2)		2.1347	2.1347	2.1347	2.1347	1.7619	3.7736	2.1347	2.1347	2.1347	2.1347	3.6970
CXX = exp(XX Sigma -0.5Sigma^2)		---	0.7116	---	---	1.5351	2.0998	0.7116	---	---	0.7116	2.2435
Reasonable Potential Multiplier = C95/CXX		---	3.0	---	---	1.1	1.8	3.0	---	---	3.0	1.6
Maximum Expected Concentration of Pollutant in		---	0	---	---	0.1606	0.0611	0	---	---	6E-06	2.8343
Acute - Concentration of Pollutant at the Edge of the		---	0.0004	---	---	0.1606	0.0054	0.0001	---	---	---	0.0296
Chronic - Concentration of Pollutant at the Edge of the		---	0	---	---	0.1606	0.0611	0	---	---	---	0.0296
Resonable Potential to Violate Acute Criteria at the		**---**	**NO RP**	**---**	**---**	**YES**	**NO RP**	**NO RP**	**---**	**---**	**---**	**NO RP**
Resonable Potential to Violate Chronic Criteria at the Edge of		**---**	**NO RP**	**---**	**---**	**YES**	**YES**	**NO RP**	**---**	**---**	**---**	**YES**
		---	Backgr	- - -	---	Backgr	Backgr	Backgr	---	---	---	- - -

Determining the Requirement for Permit Limits Through a Reasonable Potential Determination to Violate Standards at the Edge of the Mixing Zone.

Based on EPA/505/2-90-001

Notes: City of Yelms Nisqually River Outfall #003 - Reasonable potential determination to violate the surface water quality standard for heavy metals.

INPUT

		Arsenic	Cadmiu	Chromium Hex	Chromium Tri	Copper	Lead	Mercur	Nickel	Seleniu	Silver	Zinc
Confidence Level and Probability Basis:		**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**0.95**
Coefficient of Variation for the Effluent Concentration (0.6 or a calculated CV if there are more than 10		**0.6**	**0.6**	**0.6**	**0.6**	**0.4061**	**2.5621**	**0.6**	**0.6**	**0.6**	**0.6**	**2.2560**
Number of Effluent Samples or Data Points (ND):		**0**	**3**	**0**	**0**	**29**	**26**	**3**	**0**	**0**	**3**	**28**
Highest Effluent Concentration or Value (HV):		**---**	**0**	**---**	**---**	**0.14**	**0.034**	**0**	**---**	**---**	**2E-06**	**1.72**
Dilution Factors (1/{Effluent Volume Fraction}) or												
Acute Receiving Water Dilution Factor:	**4**	**4**	**4**	**4**	**4**	**1**	**4**	**4**	**4**	**4**	**4**	**4**
Chronic Receiving Water Dilution Factor:	**19.4**	**19.4**	**1**	**19.4**	**19.4**	**1**	**1**	**1**	**19.4**	**19.4**	**19.4**	**19.4**
Water Quality Standards (Concentration)												
Acute (one-hour) Criteria:		**0.36**	**0.0007**	**0.015**	**0.5024**	**0.0042**	**0.0118**	**0.0021**	**0.3939**	**0.02**	**0.0003**	**0.0324**
Chronic (n-day) Criteria:		**0.19**	**0.0003**	**0.01**	**0.0598**	**0.0032**	**0.0004**	**1.2E-**	**0.0438**	**0.005**	**---**	**0.0293**
Upstream Receiving Water Concentration:												
Upstream Concentration for Acute Condition		**---**	**0.0004**	**0.0023**	**---**	**0.0061**	**0.005**	**0.0001**	**---**	**---**	**---**	**0.0079**
Upstream Concentration for Chronic Condition		**---**	**0.0004**	**0.0023**	**---**	**0.0061**	**0.005**	**0.0001**	**---**	**---**	**---**	**0.0079**

MECB: 1-9 data points, multiply highest value by 2; 10-50 use highest

OUTPUT

	Arsenic	Cadmiu	Chromium Hex	Chromium Tri	Copper	Lead	Mercur	Nickel	Seleniu	Silver	Zinc
Percentile Represented by the Highest Concentration in (p_n) = (1 - confidence level)^1/ND	---	0.3684	---	---	0.9018	0.8911	0.3684	---	---	0.3684	0.8985
Normal Distribution Value for 95th Percentile	1.6448	1.6448	1.6448	1.6448	1.6448	1.6448	1.6448	1.6448	1.6448	1.6448	1.6448
Normal Distribution Value for XXth Percentile	---	-	---	---	1.2921	1.2327	-	---	---	-	1.2732
$s^2 = \ln(CV^2+1)$	0.3074	0.3074	0.3074	0.3074	0.1526	2.0235	0.3074	0.3074	0.3074	0.3074	1.8066
C95 = exp(1.645Sigma -0.5Sigma^2)	2.1347	2.1347	2.1347	2.1347	1.7619	3.7736	2.1347	2.1347	2.1347	2.1347	3.6970
CXX = exp(XX Sigma -0.5Sigma^2)	---	0.7116	---	---	1.5351	2.0998	0.7116	---	---	0.7116	2.2435
Reasonable Potential Multiplier = C95/CXX	---	3.0	---	---	1.1	1.8	3.0	---	---	3.0	1.6
Maximum Expected Concentration of Pollutant in	---	0	---	---	0.1606	0.0611	0	---	---	6E-06	2.8343
Acute - Concentration of Pollutant at the Edge of the	---	0.0003	---	---	0.1606	0.0190	7.65E-	---	---	---	0.7145
Chronic - Concentration of Pollutant at the Edge of the	---	0	---	---	0.1606	0.0611	0	---	---	---	0.1535
Resonable Potential to Violate Acute Criteria at the	**---**	**NO RP**	**---**	**---**	**YES**	**YES**	**NO RP**	**---**	**---**	**---**	**YES**
Resonable Potential to Violate Chronic Criteria at the Edge of	**---**	**NO RP**	**---**	**---**	**YES**	**YES**	**NO RP**	**---**	**---**	**---**	**YES**
	---	Backgr	- - -	---	Backgr	Backgr	Backgr	---	---	---	- - -

APPENDIX D--RESPONSE TO COMMENTS

Facility Name: City of Yelm Wastewater Treatment and Water Reclamation Facility

This response to comments (RTC) is an appendix to the fact sheet for the above referenced NPDES permit. The RTC summarizes comments received during the 30-day public notice and comment period on the draft permit, and provides the Department of Ecology (Department) response. All changes to the draft permit are noted below. The Department has determined to issue this permit as revised.

City of Yelm Comments:

1. **Comment:**

   For the parameter "Total Dissolved Solids" and "Dissolved Oxygen" the draft permit listed sample type as a grab sample. Yelm measures dissolved solids and dissolved oxygen with a meter by dropping a probe into the effluent channel.

   Response:

   The sample type for dissolved solids as well as dissolved oxygen has been changed from "grab" to "measurement".

2. **Comment:**

   pH is listed as a monitoring requirement for reclaimed water but there is no pH permit limit for the reclaimed water discharge.

   Response:

   The Water Reclamation and Reuse Standards do not set a limit for pH for the discharge of reclaimed water. However, the Department feels that a technology limit of 6.0 to 9.0 should be consistently achievable through the proper operation and maintenance of the treatment works and will include this limit in the final permit for the discharge of reclaimed water.

3. **Comment:**

   Some of the metals testing required in the permit are typically done from a grab sample.

   Response:

   Metals can be grab or composite samples. No change to permit.

4. **Comment:**

   Twice yearly measuring the sludge accumulation in the equalization basin is required. Since this is a complete mix basin and no accumulation of sludge is expected, can this requirement be waived?

   Response:

The Department will reduce the requirement to twice per permit term. The first measurement will take place after one year of operation and the second measurement will take place during the third year of operation. If sludge seems to be accumulating in the equalization basin a third measurement will be required during the final year of the permit term.

5. **Comment:**

Special Condition S10.C requires records of all analyses performed; records of operational problems, unit process and equipment breakdowns, and diversions to emergency storage or disposal; and all corrective or preventative action taken to be reported monthly with the DMRs. This would require a huge report to be filed each month.

Response:

The Department met with the operator on August 23, 1999, and clarified this special condition. As stated in S10.C.3, the Department is looking for a summary of actions taken during the month rather than a detailed listing of every action. No change to permit.

6. **Comment:**

The fact sheet has the following errors: The correct address for the plant is 931 N.P. road, equalization basin capacity is 1.8 million gallons, grit and rags are left in the STEP tanks and are not dealt with at the plant.

Response:

The fact sheet has been changed to reflect these errors.

Department of Ecology Comments:

7. **Comment:**

The total coliform testing frequency should remain daily with no allowance for reduction.

Response:

The daily testing for total coliform is a reliability assurance measure for reclaimed water and should not be reduced to a lesser frequency. Therefore the allowance for total coliform testing frequency reduction will be removed from the final permit. Removing the allowance for reduction in testing frequency for total coliforms in the permit does not prevent the Department from doing so in the future if conditions merit.

8. **Comment:**

Remove the weekly average limit for BOD_5 and TSS.

Response:

The Water Reclamation and Reuse Standards only require a monthly average limit for BOD_5 and TSS with no weekly maximum. Therefore the weekly average limit for BOD_5 and TSS for reclaimed water discharges will be removed from the final permit.

Department of Health Comments:

9. **Comment:**

TKN, Copper, and Lead are not state or federal MCL's and should be remove from the ground water recharge limits page. All other parameters which are not state drinking water MCL's should be separated out into a different table and labeled as additional groundwater limitations.

Response:

The Department has included two limits tables for ground water recharge by surface percolation in the final permit. The first table is labeled Ground Water Recharge Criteria and includes only those parameters of concern that are listed as primary MCLs in the drinking water standards. The second limits table for ground water recharge is labeled additional ground water limitations which include additional parameters of concern which are not listed as primary MCLs in the drinking water standards.

Skillings/Connolly Inc. Comments:

10. **Comment:**

Page 7 Section D, paragraph 2 states in part "...the Permittee is authorized to discharge Class A Reclaimed Water to infiltration basins for surface percolation at the permitted location ..." There are multiple locations proposed in the Facilities Plan. The current location at Cochrane Park is only the first one to be constructed. This permit should allow other locations as indicated in S1 Discharge Limitations for Reclaimed Water. I don't think it should be the intent that this permit be rewritten if the City adds another infiltration facility per the Facilities Plan as long as it meets the other permit requirements. This paragraph should be clarified.

Response:

The permit will be changed from "at the permitted location" to "at locations described in the approved facility plan".

11. **Comment:**

Page 25 Water Reuse Plan. What are you referring to here? Does the Facilities Plan cover this in sufficient detail? Should another plan be prepared? The Discharge Limitations defined in S1 indicate "All reclaimed water shall be applied in accordance with the use area restrictions, setbacks and signage outlined in the State Water Reclamation and Reuse Standards. ...the Permittee is authorized to provide Class A reclaimed water to public or private vendors for purposes such as , but not limited to, landscape irrigation, constructed

wetlands discharge and ground water recharge..." It is the intent of the reclaimed water system in Yelm to be a separate utility and will grow with the city. New use areas will be added to the system as the city grows. This system is well documented in the Facilities Plan. Does DOE want a new plan every time we add a new user? This section should be modified.

Response:

The lead in paragraph to S10.A will be changed to read as follows: "The Permittee shall maintain an up-to-date water reuse plan, which shall contain, but not be limited to the following:" The water reuse plan is a document that needs to be kept current on any changes to the system, users, and updated as necessary and may be requested by the Departments of Health or Ecology.

12. **Comment:**

Page 28 Paragraph 6 states "Any reduction in irrigation lands by termination of any irrigation agreements may result in permit modification or revocation. ..." This seems like an unreasonable and perhaps meaningless requirement. What is the purpose. If a user stops irrigating a portion of their land, the User Agreement should be modified, by why in the world would DOE want to revoke the permit. It the use was not in conformance with the regulations I would understand it. A reduction in irrigation area is not a non-conforming use. Please modify this requirement.

Response:

The permit will be changed by removing the sentence in paragraph S10.G.6 "Any reduction in irrigation lands by termination of any irrigation agreements may result in permit modification or revocation."